



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/655,529	09/04/2003	Tzong-Ru Han	612407-1 (nm-x-040.2)	5570
34263	7590	07/03/2008		
O'Melveny & Myers LLP IP&T Calendar Department LA-1118 400 South Hope Street Los Angeles, CA 90071-2899			EXAMINER YANG, MINCHUL	
			ART UNIT 2891	PAPER NUMBER
			MAIL DATE 07/03/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/655,529	Applicant(s) HAN ET AL.	
	Examiner Minchul Yang	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/14/08.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

1. Claims 7-10 are newly added.

Drawings

2. The drawing(s) of figure 1 received on 4/14/08 is acceptable.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-8 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Kong (Adv. Mater. 13, 2001, pages 1384-1386) as evidenced by Collins (“Collins_1”, Phys. Rev. Lett. 86, 2001, pages 3128-3131).

Kong discloses a nanostructure sensing device comprising (see, e.g., figures 1-2 and related text):

Regarding claim(s) 1, 7, 10: a substrate (page 1384, col. 2, last paragraph: “SiO₂ substrates”), said substrate being at a temperature of less than 100 °C (the substrate is capable of being at a room temperature. See, e.g., page 3130, col. 2, second paragraph: the SiO₂ substrate is at 23 °C); at least one nanostructure disposed over the substrate (figure 1: carbon nanotube

Art Unit: 2815

(CNT). Also notes that while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). See also MPEP 2114), said nanostructure being at a temperature of at least 100 °C (the CNT is capable of being at a temperature of at least 100 °C. See, e.g., Collins_1, page 3130, col. 2, first paragraph: the CNT as shown in figure 2 was heated up to at least 500 °C before the breakdown occurred); and at least two conductive elements disposed over the substrate and electrically connected to the at least one nanostructure (figure 1a); wherein said nanostructure is coated or functionalized with an agent (figure 1, caption: the CNT is coated with Pd particles for H₂ detection) that renders the nanostructure sensing device responsive to a material and thereby configured to act as a sensor to the material;

Regarding claim(s) 2-3: wherein the nanostructure comprises a nanotube and the nanostructure comprises a plurality of nanotubes (see, e.g., figures 1a and 2a);

Regarding claim(s) 4-5: wherein the nanostructure is maintained at a temperature of at least about 200 °C; and wherein the nanostructure is maintained at a temperature of at least about 300 °C (see the examiner's statement above regarding claim 1);

Regarding claim(s) 6: wherein the nanostructure is maintained at an elevated temperature by passing a current of at least about 10 μA through the nanostructure (the CNT of Kong is capable of doing so. See, e.g., Collins_1, figure 2: the CNT can withstand up to at least 200 μA).

Regarding claim(s) 8: wherein further comprising water surrounding at least part of the nanostructure (page 1385, col. 1, second paragraph: the CNT is in air. See also the Applicant's specification, page 3, last paragraph).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins (Science, 2001, pages 706-709) in view of Simon (Sensors and actuators B73, 2001, pages 1-26) and Kong.

(a) Collins discloses a nanostructure sensing device comprising (see, e.g., figure 1 and related text):

Regarding claim(s) 1: a substrate (figure 1b), said substrate being at a temperature of less than 100 °C (see, e.g., page 706, col. 3, third paragraph: “room temperature”); at least one nanostructure disposed over the substrate (the caption of figure 1c: “SWNT robes”), said nanostructure being at a temperature of at least 100 °C (figure 1c: the thinning process involves a step of heating the SWNT robes up to at least 500 °C before thinning occurs. See also Collins reference A, page 3130, col. 2, first paragraph); and at least two conductive elements disposed over the substrate and electrically connected to the at least one nanostructure (figure 1);

Regarding claim(s) 2-3: wherein the nanostructure comprises a nanotube (figure 1b); and the nanostructure comprises a plurality of nanotubes (figure 1c);

Regarding claim(s) 4-5: wherein the nanostructure is maintained at a temperature of at least about 200 °C; and wherein the nanostructure is maintained at a temperature of at least about

Art Unit: 2815

300 °C (see the examiner's statement above regarding claim 1); and

Regarding claim(s) 6: wherein the nanostructure is maintained at an elevated temperature by passing a current of at least about 10 μ A through the nanostructure (figure 1a: up to at least 150 μ A).

(b) Regarding claim(s) 1 and 9, Collins discloses the features previously outlined, but does not expressly disclose the following limitation(s): wherein said nanostructure is coated or functionalized with tin oxide that renders the nanostructure sensing device responsive to a material and thereby configured to act as a sensor to the material.

However, it was generally known in the art that CNT could be useful for molecular sensing with high sensitivity by modifying its surface with active ingredients, because of its unique structural, thermal, and electrical properties such as high aspect ratio with one-dimensional nature, high carrier mobility, and high thermal stability. For instance, Kong teaches a CNT gas sensor (figure 1), wherein CNTs are coated with a Pd film to be used as a hydrogen sensor with high sensitivity (note that Pd was well known as a sensing material for hydrogen). It was also generally known in the art that tin oxide was a typical material as a sensing material for CO and NO_x (see, e.g., Simon, pages 1, col. 2, last paragraph). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the surface of the CNT in the Collins device with tin oxide in order to make a gas sensor for CO and NO_x with high sensitivity and fast response by utilizing the unique structural, thermal, and electrical properties of CNT.

Response to Arguments

7. Applicant's arguments filed on 4/14/08 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Minchul Yang whose telephone number is (571) 270-1750. The examiner can normally be reached on Monday through Friday 7:30 AM - 5:00 PM E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272 -1722. The fax phone number for the

Art Unit: 2815

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MY /M. Y./

Examiner, Art Unit 2891

/Matthew C. Landau/

Primary Examiner, Art Unit 2815